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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

COURTENAY III, ST JOHN

ART UNIT	PAPER NUMBER
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2126

DATE MAILED: 11/28/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/855,453

Applicant(s)

AGESEN ET AL.

Examiner

St. John Courtenay III

Art Unit

2126

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13-15, 19-31, 37-47 is/are rejected.
- 7) ☒ Claim(s) 11, 12, 16-18 and 32-36 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,5.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Detailed Action

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-10, 13-15, 19-31, 37-47 are rejected under 35 U.S.C. § 102(e) as being anticipated by **Wolczko** (PCT WO 00/00885).

As per independent claim 1:

Wolczko teaches a method of managing a generational memory, the method comprising:

- sampling, at run-time of an execution sequence, lifetimes of a representative subset of memory objects in the generational memory [e.g., see "age field" and associated discussion page 9, beginning line 7 and also Fig. 5]; and
- pretenuring, based on the sampled lifetimes, at least some of the memory objects allocated from the generational memory during the execution sequence [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion].

As per independent claim 20:

Wolczko teaches a method of operating an automatically reclaimed storage environment in accordance with object lifetime statistics, the method comprising:

- selecting representative subsets of memory objects for each of plural categories thereof [see selection of generations, page 9, discussion beginning line 2];
- sampling, during a program execution, lifetimes of memory objects from the representative subsets [e.g., see "age field" and associated discussion page 9, beginning line 7 and also Fig. 5]; and
- tailoring, during the program execution, a storage management action based on the sampled lifetimes for a corresponding one of the categories [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion].

As per independent claim 28:

Wolczko teaches a storage management facility for a computational system, the storage management facility comprising:

- an object sampler operable to sample lifetimes of at least a subset of objects instantiated in the computational system during execution of a program [e.g., see "age field" and associated discussion page 9, beginning line 7 and also Fig. 5]; and

a storage allocation facility operable during the execution of the program to allocate new objects corresponding to respective of the sampled objects based at least in part on

the sampled object lifetimes [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion; see also discussion of allocation site histograms, page 9, line 3].

As per independent claim 41:

Wolczko teaches a computer program product encoded in at least one computer readable medium, the computer program product comprising:

- at least one functional sequence for maintaining per-category object lifetime statistics based on a sampled subset of objects using weak references and associated allocation time information [e.g., see "age field" and associated discussion page 9, beginning line 7 and also Fig. 5; see also discussion of allocation site histograms, page 9, line 3]; and
- at least one functional sequence for tenuring objects in accordance with those of the object lifetime statistics corresponding thereto [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion; see also discussion of allocation site histograms, page 9, line 3].

As per independent claim 46:

Wolczko teaches an apparatus comprising:

means for sampling instances of software objects to maintain lifetime predictions for categories thereof [e.g., see "age field" and associated discussion page 9, beginning line

7 and also Fig. 5; see also discussion of allocation site histograms, page 9, line 3]; and

- means for altering object category-specific storage management policies at run-time in response to the lifetime predictions [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion; see also discussion of allocation site histograms, page 9, line 3].

As per dependent claims 2 – 4, 47:

Wolczko teaches the pretenuring is performed for those of the memory objects for which corresponding sampled lifetimes exceed a first metric [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion; see also discussion of allocation site histograms, page 9, line 3].

As per dependent claim 5:

Wolczko teaches the sampling includes sampling of representative subsets for plural categories of the memory objects and further comprising:

- allocating the memory objects using category-specific allocation functionality [e.g., see "identification codes associated with the tenured objects" and associated discussion page 11, line 10]; and
- selectively modifying the category-specific allocation functionality to pretenure, on subsequent allocations, memory objects corresponding to those of the categories for which the sampled lifetimes exceed a metric [e.g., see

"death rate" and associated discussion page 11, beginning line 14].

As per dependent claim 6:

Wolczko teaches the selective modification of the category-specific allocation functionality includes instantiating category-specific allocation methods that allocate new objects of a corresponding category directly into a tenured generation of the generational memory [e.g., see "adding an additional bit to each object's header" and associated discussion page 11, beginning line 28].

As per dependent claims 7 & 8:

Wolczko teaches the sampled lifetimes are characterized as per-category, mean lifetimes and the sampled lifetimes are characterized as per-category, distributions of lifetimes [e.g., see also discussion of allocation site histograms, page 9, line 3].

As per dependent claims 9 & 10:

Wolczko teaches the categories are object class-specific and the categories are call-site specific [e.g., see "allocation site identification codes" and associated discussion page 11, line 8].

As per dependent claim 13:

See the rejection of claim 5 above.

As per dependent claims 14 & 15:

See the rejection of claims 41-45.

As per dependent claim 19:

See the rejection of claims 5 and 41.

As per dependent claims 21– 27:

Wolczko teaches the storage management action includes pretenuring subsequently allocated memory objects of the

corresponding category, OR wherein the storage management action includes promoting memory objects of the corresponding category to a particular generation, OR wherein the storage management action includes steering, on promotion, memory objects of the corresponding category to a particular store OR wherein the storage management action includes allocating subsequently allocated memory objects of the corresponding category from a particular store, and the like steps of allocating and selection, as claimed [e.g., see page 9, lines 9, i.e., "Next, if the age field plus one is equal to the tenure value, memory manager 306 tenures the object (step 505)" and associated discussion].

As per dependent claims 29, 30, 37 – 40, 42-44:

See the rejections of claims 2-4 and 21-27 above.

As per dependent claim 31:

Wolczko teaches the categories correspond to one or more of object types and/or allocation call site and/or receiver object . [e.g., see "allocation site identification codes" and associated discussion page 11, line 8; see allocation site definition, page 7, 6; see objects disclosed on page 9, e.g., lines 5, 12, 23, 25].

As per dependent claim 45:

Wolczko teaches the at least one computer readable medium is selected from the set of a disk, tape or other magnetic, optical, or electronic storage medium and a network, wireline, wireless or other communications medium [see page 5, lines 3 - 5].

Allowable Subject Matter:

Claims 11, 12, 16-18 and 32 - 36 appear to be allowable over the prior art of record if rewritten to include all of the limitations of the base claim and any intervening claims, subject to the results of a final search. These claims stand objected to as being dependent upon a rejected base claim.

The prior art of record does not appear to teach nor fairly suggest the following elements operatively coupled as claimed:

- (claim 11) - categories correspond to activation record stack profiles.
- (claim 12) - categories correspond to both type of memory object and call-site for allocation where the selective modification of the category-specific allocation functionality includes in-lining instructions at the corresponding call site, the in-lined instructions allocating new memory objects of the corresponding type directly into a tenured generation of the generational memory.
- (claim 16) - the step of selecting the representative subset based on allocation buffer overflow.
- (claim 17) - selecting the representative subset using per class allocator functionality.
- (claim 18) - selecting the representative subset based on identity of an allocating thread.
- (claim 32) - where the object sampler is responsive to transition of at least one of the sampled objects from a reachable state to an unreachable state.

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- (claim 33) - where the object sampler employs a weak reference construct of the computational system to identify those of the sampled objects that have become unreachable.
- (claims 35 & 36 depend upon claim 33)

Prior Art not relied upon:

Please refer to the references listed on the attached PTO-892 which are not relied upon in the claim rejections detailed above.

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How to Contact the Examiner:

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to **St. John Courtenay III** whose voice telephone number is **(703) 308-5217**. A voice mail service is also available at this number. Normal Flex work schedule: M – F 7:30 AM - 4:00 PM

- **All responses sent by U.S. Mail should be mailed to:**

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Patent Customers advised to FAX communications to the USPTO

<http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/faxnotice.pdf>

Effective Oct. 15, 2003, ALL patent application correspondence transmitted by FAX must be directed to the new PTO central FAX number:


**NEW PTO CENTRAL FAX NUMBER:
703-872-9306**

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- Any inquiry of a general nature or relating to the status of this application should be directed to the **TC 2100 Group receptionist: (703) 305-3900**.

Please direct inquiries regarding fees, paper matching, and other issues not involving the Examiner to:

Technical Center 2100 CUSTOMER SERVICE: 703 306-5631

The Manual of Patent Examining Procedure (MPEP) is available online at: <http://www.uspto.gov/web/offices/pac/mpep/index.html>


**ST. JOHN COURTENAY III
PRIMARY EXAMINER**